CLAIMS

1) A method of determining the thermal profile of a drilling fluid circulating in a well under drilling, wherein the following stages are carried out :

a) determining a general expression $\theta 1$ for the thermal profile of the fluid inside the drill string in the well and a general expression $\theta 2$ for a thermal profile of the fluid in the corresponding annulus, using the heat propagation equation that takes into account a thermal profile of the medium surrounding the well,

b) measuring the temperature of the fluid at the well inlet, T1, at the well bottom, T2, and at the well outlet, T3,

c) laying down that expressions $\theta 1$ and $\theta 2$ meet the temperature boundary conditions T1, T2 and T3.

2) A method as claimed in claim 1 wherein, after stage c), the following stage is carried out :

d) drawing the thermal profile of the drilling fluid as a function of the depth.

3) A method as claimed in claims 1 and 2, wherein stages b), c) and d) are repeated so as to obtain a real-time temperature profile.

4) A method as claimed in any one of claims 1 to 3, wherein :

- in stage a), general expressions $\theta 1$ and $\theta 2$ comprise unknown constants,
- in stage c), it is laid down that expressions $\theta 1$ and $\theta 2$ meet the boundary temperature conditions T1, T2 and T3 by determining said unknown constants.

5) A method as claimed in any one of claims 1 to 4 wherein, in stage a), the heat propagation equation taking account of at least the thermal equation of the medium surrounding the well, the flow rate of the fluid and the balance of the thermal exchanges undergone by the fluid is used, said thermal exchanges comprising at least exchanges between the ascending and descending drilling fluid.

6) A method as claimed in any one of claims 1 to 5 wherein, in stage a), the heat propagation equation in a homogeneous medium on a cylinder of infinite height centered on the well is used, said cylinder comprising the drill string that guides the descending fluid and the annulus surrounding said drill string, which guides the ascending fluid.

7) A method as claimed in any one of claims 1 to 6, wherein :

- in stage a), general expressions θ1 and θ2 are each split up into several independent equations,

- in stage c), furthermore, it is laid down that the thermal profiles and the derivatives of the thermal profiles of the fluid within the drill string and in the corresponding annulus are continuous.

8) A method as claimed in any one of claims 1 to 5 applied to a vertical offshore well, wherein :

- in stage a), each general expression θ1 and θ2 is split up into two independent equations, θ11 and θ12, θ21 and θ22 respectively, by taking into account the thermal profile of the medium surrounding the well,

- in stage c), furthermore, it is laid down that the thermal profiles and the derivatives of the thermal profiles of the fluid within the drill string and in the corresponding annulus are continuous.

9) Use of the method as claimed in any one of claims 1 to 7 for calculation of the pressure drops of the drilling fluid circulating in a well under drilling.

10) Use of the method as claimed in any one of claims 1 to 7 for calculation of the hydrate formation zones in the fluid during drilling.